



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/604,218	06/27/2000	Tulin Kuzulugil Hidayetoglu	98-R-CLU-363	4131

7590 06-04/2002

Eaton Corporation
Patent Law Department
Eaton Center
1111 Superior Avenue
Cleveland, OH 44114-2584

EXAMINER

TSOY, ELENA

ART UNIT	PAPER NUMBER
----------	--------------

1762

DATE MAILED: 06/04/2002

10

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/604,218

Applicant(s)

HIDAYETOGLU, TULIN
KUZULUGIL

Examiner

Elena Tsoy

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 March 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 and 20-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15, 20-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 9
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Response to Amendment

1. Amendment filed on March 26, 2002 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claims 1-4, 6-12, 14, 15, 20, 21, 23** are rejected under 35 U.S.C. 103(a) as being unpatentable over Booher (US 5,156,787) in view of Miyamoto et al (US 6,001,440).

As to claim 1-3, 6, 8, 11, 12, 14, 15, 20, Booher discloses a friction material with improved wear resistance and thermal conductivity (See column 1, lines 18-23; 30-33), comprising a functionally graded material including a composite material having heat and wear resistant fibers (See column 2, lines 28-45) therein impregnated with a resin (See Fig. 1; column 1, line 62); and a plurality of heat conducting elements situated within said functionally graded material in a selected orientation and spatial distribution such as evenly distributed carbon fibers oriented perpendicular to a friction surface (See Fig. 2; column 2, lines 29-34, 61-68) and (uniformly dispersed) copper powder, copper alloy powder (See column 2, lines 58-60) to enhance the dissipation of heat (See column 2, lines 58-60).

Booher fails to teach that the heat conducting elements are situated within said functionally graded material with a varying concentration so that the concentration of the heat

Art Unit: 1762

conducting elements decreases from the first engaging friction surface to the second non-engaging surface for transferring heat away from the first friction surface.

Miyamoto et al teach that a composite material containing heat conducting elements such as copper powder (See column 2, lines 57-60) dispersed therein with a concentration gradient (See column 2, lines 16-18), e.g., in the direction of the thickness of a film (See column 2, lines 36-43), so that the concentration of the heat conducting elements decreases from the hot surface, has high thermal conductivity in addition to excellent mechanical characteristics (See column 6, lines 18-32; column 7, lines 25-33) compared to a composite material containing uniformly dispersed heat conducting elements (See column 1, lines 37-43); and therefore may be used in various fields as a medium for positive heating or, conversely, as a *heat dissipating medium* for transferring heat away from the hot surface for the use in application fields where heat accumulation may cause problems (See column 7, lines 43-47).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified a composite material of Booher by varying concentration of the heat conducting elements so that their concentration decreases from the first engaging friction (hot) surface to the second non-engaging surface with the expectation of providing the desired high thermal conductivity in addition to excellent mechanical characteristics, as taught by Miyamoto et al, in order to enhance the dissipation of heat from the hot first friction surface.

As to claims 4, 7, Booher further teaches that the heat and wear resistant fibers comprise aramid fibers (See column 2, line 33).

As to claims 9, 10, Booher further teaches that the friction material is for brake pads, clutch facing (See column 2, lines 65-67).

As to claim 21, Booher fails to teach that the concentration of the heat conducting elements on the first friction surface ranges between about 22.5% to about 42.5 wt%.

Miyamoto et al further teach that the concentration of the heat conducting elements is 10-30 wt % (See column 3, lines 39-44), i.e., varies from 10 to 30 wt% (See column 4, lines 26-39).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified heat conducting elements in a composite material of Booher by varying concentration of the heat conducting elements from 10 to 30 wt% so that their concentration decreases from the first engaging friction (hot) surface to the second non-engaging surface with the expectation of providing the desired high thermal conductivity in addition to excellent mechanical characteristics, as taught by Miyamoto et al, in order to enhance transferring heat away from the hot first friction surface.

As to claim 23, Booher fails to teach that the decrease in concentration of the heat conducting elements is over a depth of 0.05-0.1 inch.

Miyamoto et al further teach that thickness of the composite material having concentration gradient of the heat conducting elements may vary depending on the intended use but, generally, it is 20-300 microns (See column 3, lines 34). Also the mechanical characteristics of the composite material are little influenced by the thinness (depth) of the composite material (See column 3, lines 34-38).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have made a composite material of combination of Booher and Miyamoto et al so that the concentration of the heat conducting elements decreases over any depth depending on the intended use including depth of 0.05-0.1 inch, since mechanical characteristics of the

composite material having concentration gradient of the heat conducting elements are little influenced by the thinness of the composite material, as taught by Miyamoto et al.

4. **Claims 1, 2, 4-12, 14, 20, 21, 23** are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al (US 5,004,497) in view of Miyamoto et al (US 6,001,440).

As to claim 1, 2, 6, 8, 11, 12, 14, 20, Shibata et al disclose a friction material with improved wear resistance and thermal conductivity (See column 1, lines 11-34, 55-56; column 2, lines 1-3; column 4, lines 1-4), comprising:

a functionally graded material including a composite material having heat and wear resistant fibers (See column 1, lines 50-56; column 2, lines 1-3; column 4, lines 1-4, 16-23) therein impregnated with a resin (See column 2, lines 5, 20-21; column 5, lines 32-38); and

a plurality of heat conducting elements situated within said functionally graded material such as (uniformly dispersed) copper powder, copper alloy powder (See column 4, lines 31-65) and evenly distributed carbon fibers (See column 4, lines 5-8), which contribute to prevention of vapor locking of friction material (transferring heat away) (See column 3, lines 63-68).

Shibata et al fail to teach that the heat conducting elements are situated within said functionally graded material in a selected orientation and spatial distribution with a varying concentration so that the concentration of the heat conducting elements decreases from the first engaging friction surface to the second non-engaging surface for transferring heat away from the first friction surface.

Miyamoto et al teach that a composite material containing heat conducting elements such as copper powder (See column 2, lines 57-60) dispersed therein with a concentration gradient (See column 2, lines 16-18), e.g., in the direction of the thickness of a film (See column 2, lines

Art Unit: 1762

36-43), so that the concentration of the heat conducting elements decreases from the hot surface, has high thermal conductivity in addition to excellent mechanical characteristics (See column 6, lines 18-32; column 7, lines 25-33) compared to a composite material containing uniformly dispersed heat conducting elements (See column 1, lines 37-43); and therefore may be used in various fields as a medium for positive heating or, conversely, as a *heat dissipating medium* for transferring heat away from the hot surface for the use in application fields where heat accumulation may cause problems (See column 7, lines 43-47).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified orientation and spatial distribution of uniformly dispersed heat conducting elements in a composite material of Shibata et al by varying concentration of the heat conducting elements so that the concentration decreases from the first engaging friction (hot) surface to the second non-engaging surface with the expectation of providing the desired high thermal conductivity in addition to excellent mechanical characteristics, as taught by Miyamoto et al, in order to enhance transferring heat away from the hot first friction surface for prevention of vapor locking of friction material.

As to claims 4, 5, 7, Shibata et al further teach that the heat and wear resistant fibers comprise aramid fibers (See column 2, lines 1-3, 56-60) such as Kevlar fibers (See column 3, lines 8-10).

As to claims 9, 10, Shibata et al further teach that the friction material is for brake pads, clutch facing (See column 1, lines 5-7).

As to claim 21, Shibata et al fail to teach that the concentration of the heat conducting elements on the first friction surface ranges between about 22.5% to about 42.5 wt%.

Miyamoto et al further teach that the concentration of the heat conducting elements is 10-30 wt % (See column 3, lines 39-44), i.e., varies from 10 to 30 wt% (See column 4, lines 26-39).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified heat conducting elements in a composite material of Shibata et al by varying concentration of the heat conducting elements from 10 to 30 wt% so that their concentration decreases from the first engaging friction (hot) surface to the second non-engaging surface with the expectation of providing the desired high thermal conductivity in addition to excellent mechanical characteristics, as taught by Miyamoto et al, in order to enhance transferring heat away from the hot first friction surface for prevention of vapor locking of friction material.

As to claim 23, Shibata et al fail to teach that the decrease in concentration of the heat conducting elements is over a depth of 0.05-0.1 inch.

Miyamoto et al further teach that thickness of the composite material having concentration gradient of the heat conducting elements may vary depending on the intended use but, generally, it is 20-300 microns (See column 3, lines 34). Also the mechanical characteristics of the composite material are little influenced by the thinness (depth) of the composite material (See column 3, lines 34-38).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have made a composite material of combination of Shibata et al and Miyamoto et al to have the decrease in concentration of the heat conducting elements over any depth depending on the intended use including depth of 0.05-0.1 inch, since mechanical characteristics of the

composite material having concentration gradient of the heat conducting elements are little influenced by the thinness of the composite material, as taught by Miyamoto et al.

5. **Claims 3, 15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al (US 5,004,497) in view of Miyamoto et al (US 6,001,440), as applied above, and further in view of Darfler (US 5,498,462).

Combination of Shibata et al and Miyamoto et al fails to teach that the heat conducting elements in a composite material are positioned substantially normal to the friction surface.

Darfler teaches that effectiveness of heat transfer in a composite material having heat conducting elements depends on orientation of the heat conducting elements: the most effective heat transfer occurs when the heat conducting elements are positioned substantially normal to a surface of the composite material to transfer heat away from the surface (See Fig. 3; column 8, lines 42-52; column 10, lines 46-54).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have positioned the heat conducting elements in a composite material of combination of Shibata et al and Miyamoto et al substantially normal to the friction surface with the expectation of providing the desired most effective heat transfer from the friction surface, as taught by Darfler.

6. **Claims 13, 22** are rejected under 35 U.S.C. 103(a) as being unpatentable over Booher (US 5,156,787) in view of Miyamoto et al (US 6,001,440), as applied above, and further in view of Nakamoto et al (US 6,098,612).

Booher further teaches that a heat conducting composite material comprises the heat conducting elements such as carbon fibers can be woven in with other fibers such as aramid

Art Unit: 1762

fibers (See column 2, lines 31-34) and copper powder dispersed in a resin material (See column 2, lines 50-60).

Combination of Booher and Miyamoto et al fails to teach that copper in a composite material is a copper thread (Claim 13) being woven with the aramid fibers (Claim 22).

Nakamoto et al teach that a woven fabric containing combination of synthetic yarns with a metal powder dispersed in a resin material is a functionally equivalent to a woven fabric made up of metallic fibers such as copper threads and fibers other than the metallic fibers for the use as high heat diffusion material (See column 16, lines 38-51).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used copper threads woven in with other fibers instead of copper powder in a composite material of combination Booher and Miyamoto et al since Nakamoto et al teach that a woven fabric containing synthetic yarns with a metal powder dispersed in a resin material is functionally equivalent to a woven fabric made up of metallic fibers such as copper threads and fibers other than the metallic fibers for the use as high heat diffusion material.

Response to Arguments

7. Applicant's arguments with respect to claims 1-15, 20-23 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elena Tsoy whose telephone number is (703) 605-1171. The examiner can normally be reached on 9:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

ET

Elena Tsoy
Examiner
Art Unit 1762

May 29, 2002


SHRIVE P. BECK
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700